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AN APPARATUS AND METHOD FOR PROCESSING MEDIA

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AN APPARATUS AND METHOD FOR PROCESSING MEDIA

FIELD OF THE INVENTION

The present invention relates in general to an image-forming apparatus and in particular to producing images by rupturing unexposed
5 microcapsules in a photosensitive media by applying pressure with a magnetically loaded roller.

BACKGROUND OF THE INVENTION

Image-forming apparatus that process photosensitive materials that include microcapsules containing image-forming materials are well known in the
10 art. In this type of apparatus microcapsules are image wise exposed to radiation from an exposure device based on imaging information sent to the exposure device. The photosensitive microcapsules encapsulating the imaging material become hardened when exposed to radiation from the exposure device. Microcapsules that are not exposed by the radiation, and hence do not become
15 hardened, are ruptured by applying pressure. The image-forming material from the ruptured microcapsules is released to begin the development of the desired image. Image-forming apparatus that employ photosensitive microencapsulated imaging materials are disclosed in U.S. Patent Nos. 4,399,209; 4,416,966; 4,766,050; 5,783,353; and 5,916,727.

SUMMARY OF THE INVENTION

Briefly, according to one aspect of the present invention an apparatus for processing media contains microcapsules which contain a first segmented rupturing roller having multiple roller segments. A second segmented rupturing roller has multiple roller segments. The roller segments on the first
25 segmented rupturing roller are offset from roller segments on the second rupturing roller. The multiple roller segments rupture unexposed microcapsules in the media.

Media passes between the first and second segmented roller wherein a force is applied to the independent roller segments in both the first
30 segmented roller and the second segmented roller wherein independent roller segments in both the first segmented roller and the second segmented roller

ruptures unexposed microcapsules in the media to form an image within the photosensitive media.

BRIEF DESCRIPTION OF THE DRAWINGS

5 A more complete understanding of the invention and its advantages will become apparent from the detailed description taken in conjunction with the accompanying drawings, wherein examples of the invention are shown, and identical reference numbers have been used, where possible, to designate identical elements that are common to the figures referenced below:

10 Figure 1 is a schematic, cross sectional view of an imaging apparatus according to the present invention;

Figure 2 is a schematic, cross sectional view of an image exposure device used in the imaging apparatus shown in Figure 1;

15 Figure 3 shows a ferrous load plate and a segmented rupturing roller having magnetic load segments and rupturing roller segments according to the present invention;

Figure 4 shows a side view of the ferrous load plate and a segmented rupturing roller shown in Figure 3;

20 Figure 5 shows a pair segmented rupturing with at least one of the segmented rupturing roller being magnetically loaded according to the present invention;

Figure 6 shows a side view of a pair segmented rupturing with at least one of the segmented rupturing roller being magnetically loaded in Figure 5;

Figure 7 shows dual flanged ferrous rupturing roller and magnetic load bar suitable for multi-pass rupturing according to the present invention;

25 Figure 8 shows two segmented rupturing rollers each having an external pressure load roller according to the present invention; and

Figure 9 shows two segmented rupturing rollers each having an internal loading pressure according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

30 The present invention will be directed in particular to elements forming part of, or in cooperation more directly with an apparatus in accordance

with the present invention. It is to be understood that elements not specifically shown or described may take various forms well known to those skilled in the art.

Referring now to Figure 1 a schematic, cross sectional view of an imaging apparatus 10 for exposing photosensitive media 44 utilizing an image exposure device 12 is shown. Photosensitive media 44 is removed from media tray 20 to the preheat station 22. Once the preheat step is complete the preheated photosensitive media 56 proceeds to the exposure station 24 to be image wise exposed by image exposure device 12. The exposed photosensitive media 58 is then passed through the microcapsule rupturing device 50 where pressure is applied by microcapsule rupturing rollers 52. The developed photosensitive media 60 is then passed to the post heating station 32 and from there to the media exit tray 34 as a completed image 62.

Figure 2 shows a schematic, cross sectional view of image exposure device 12 shown in Figure 1. Image exposure device 12 exposes photosensitive media 44, which has a plurality of microcapsules 46 with an image-forming material 48 encapsulated within the microcapsules 46. The microcapsules are coated on support base 16 and have an overcoat 14. Image wise exposure of the selected microcapsules 46 hardens microcapsules 46. Exposed microcapsules 38 when processed through a microcapsule rupturing device 50 that utilizes microcapsule rupturing roller 52, shown in Figure 1, are not ruptured. The unexposed microcapsules 46 are ruptured releasing image-forming material 48 encapsulated within the unexposed microcapsules 40 to form an image within the photosensitive media 44.

Figures 3 and 4 show a segmented rupturing roller 90 having alternating rupturing roller segments 92 and ferrous load segments 94 that are allowed to apply pressure to exposed photosensitive media 58 independently of each other, with exposed photosensitive media 58 between the segmented rupturing roller 90 and the skid plate 72. The magnetic bar 82 creates a force of attraction between the segmented rupturing roller 90 by means of the ferrous load segments 94 and magnetic bar 82, which ruptures any unexposed microcapsules 40 within exposed photosensitive media 58 as exposed photosensitive media 58 passes between the segmented rupturing roller 90, skid plate 72, and magnetic bar

82. The ruptured microcapsules release image-forming material 48 encapsulated within the unexposed microcapsules 40 to form an image within the photosensitive media 44.

Entrance flange 18 on both ends of the segmented rupturing roller 90 maintain a fixed distance between the segmented rupturing roller 90 and the skid plate 72. This is necessary so that exposed photosensitive media 58 is allowed to pass between the segmented rupturing roller 90 and the skid plate 72 since the attraction force between the segmented rupturing roller 90 and the magnetic bar 82 would make it difficult to separate the surfaces of the ferrous rupturing roller 42 and the skid plate 72 if they were allowed to contact each other with no exposed photosensitive media 58 present.

Figures 5 and 6 show an upper segmented rupturing roller 110 and lower segmented rupturing roller 112 both having alternating rupturing roller segments 92 which can be made of plastic, and load arms 104 that apply pressure to exposed photosensitive media 58 independently of each other with the load arm 104 pivoting about pivot 96, with exposed photosensitive media 58 between the segmented rupturing roller 90 and the skid plate 72. The second magnet 100 and the third magnet 102 creates a force of attraction between them and apply a load to the upper segmented rupturing roller 110 and lower segmented rupturing roller 112 which ruptures any unexposed microcapsules 40 within exposed photosensitive media 58 as exposed photosensitive media 58 passes between the upper segmented rupturing roller 110 and lower segmented rupturing roller 112 releasing image-forming material 48 encapsulated within the unexposed microcapsules 40 to form an image within the photosensitive media 44. The first magnet 98 is polarized such it is in repulsion with second magnet 100 that if exposed photosensitive media 58 varies in thickness a repulsive force will be applied to the upper segmented rupturing roller 110 and lower segmented rupturing roller 112 to compensate. Entrance flange 18 on both ends of the segmented rupturing roller 90 maintain a fixed distance between the segmented rupturing roller 90 and the skid plate 72. This is necessary so that exposed photosensitive media 58 is allowed to pass between the segmented rupturing roller 90 and the skid plate 72 since the attraction force between the segmented

rupturing roller 90 and the magnetic bar 82 would make it difficult to separate the surfaces of the ferrous rupturing roller and the skid plate 72 if they were allowed to contact each other with no exposed photosensitive media 58 present.

Figure 7 shows an image exposure device 12 mounted on mounting
5 block 80 that translates along mounting shaft 84. Dual flanged ferrous rupturing roller 86 rides on mounting shaft 84 as the exposure device 12 is translated along translation shaft 78, while exposing photosensitive media 58, and is attracted to magnetic bar 82. Magnetic bar 82 creates a force of attraction between the dual flanged ferrous rupturing roller 86 and magnetic bar 82, which ruptures any
10 unexposed microcapsules 40 within exposed photosensitive media 58 as exposed photosensitive media 58 passes between the dual flanged ferrous rupturing roller 86 and magnetic bar 82 releasing image-forming material 48 encapsulated within the unexposed microcapsules 40 to form an image within the photosensitive media 44.

15 Although the embodiments shown thus far have used permanent magnets, electro-magnets have some advantages in certain situations. For example, electro-magnets allow the amount of force exerted on exposed photosensitive media 58 to be varied. This may be necessary as changes are made at the factory to alter or enhance the materials used for the microcapsules
20 contained in exposed photosensitive media 58. Using electro-magnetic rollers and electro-magnetic device to exert pressure on the media also eliminates the need for flanges at each end of the roller. The pressure on the media can be varied with the electro-magnetic devices to exert the proper pressure to crush the unexposed microcapsules 40 and the electro-magnets could be deenergized to force the
25 rollers apart when new media is loaded. Also, the field on one of the rollers or both of the rollers could be reversed to electro-magnetically force the rollers apart.

The permanent magnets described in the present invention may be made of a number of different materials known in the art including rare-earth elements. For example, a permanent magnet may be made of a rare-earth material
30 such as neodymium-iron-boron (NdFeB).

Figure 8 shows an upper segmented rupturing roller 110 and lower segmented rupturing roller 112 both having rupturing roller segments 92 which

can be made of plastic, but not limited to, with exposed photosensitive media 58 between the upper segmented rupturing roller 110 and lower segmented rupturing roller 112. Upper pressure roller 114 and lower pressure roller 116 both having a deformable rubber layer 106 preferable made from a silicon having a durometer
5 between 30 and 70. Pressure roller load shaft 118 apply pressure to upper segmented rupturing roller 110 and lower segmented rupturing roller 112 such that rupturing roller segments 92 applies pressure to the exposed photosensitive media 58 independently which ruptures any unexposed microcapsules 40 within exposed photosensitive media 58 as exposed photosensitive media 58 passes
10 between upper segmented rupturing roller 110 and lower segmented rupturing roller 112. The ruptured microcapsules release image-forming material 48 encapsulated within the unexposed microcapsules 40 to form an image within the photosensitive media 44.

Entrance flange 18 on both ends of the upper segmented rupturing
15 roller 110 and lower segmented rupturing roller 112 maintain a fixed distance between the upper segmented rupturing roller 110 and lower segmented rupturing roller 112. This is necessary so that exposed photosensitive media 58 is allowed to pass between the upper segmented rupturing roller 110 and lower segmented rupturing roller 112 since the force between the upper segmented rupturing roller
20 110 and lower segmented rupturing roller 112 would make it difficult to separate the surfaces of the upper segmented rupturing roller 110 and lower segmented rupturing roller 112 if they were allowed to contact each other with no exposed photosensitive media 58 present.

Figure 9 shows an upper segmented rupturing roller 110 and lower
25 segmented rupturing roller 112 both having rupturing roller segments 92 which can be made of plastic, with exposed photosensitive media 58 between the upper segmented rupturing roller 110 and lower segmented rupturing roller 112. Upper segmented rupturing roller 110 and lower segmented rupturing roller 112 both having an internal deformable rubber layer 108 preferable made from a silicon
30 having a durometer between 30 and 70. Pressure roller shaft 118 applies pressure to rupturing roller segments 92 such that rupturing roller segments 92 can apply pressure to the exposed photosensitive media 58 independently which ruptures

any unexposed microcapsules 40 within exposed photosensitive media 58 as exposed photosensitive media 58 passes between upper segmented rupturing roller 110 and lower segmented rupturing roller 112. The ruptured microcapsules release image-forming material 48 encapsulated within the unexposed
5 microcapsules 40 to form an image within the photosensitive media 44.

Entrance flange 18 on both ends of the upper segmented rupturing roller 110 and lower segmented rupturing roller 112 maintain a fixed distance between the upper segmented rupturing roller 110 and lower segmented rupturing roller 112. This is necessary so that exposed photosensitive media 58 is allowed
10 to pass between the upper segmented rupturing roller 110 and lower segmented rupturing roller 112 since the force between the upper segmented rupturing roller 110 and lower segmented rupturing roller 112 would make it difficult to separate the surfaces of the upper segmented rupturing roller 110 and lower segmented rupturing roller 112 if they were allowed to contact each other with no exposed
15 photosensitive media 58 present.

The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the scope of the invention.

PARTS LIST

10	imaging apparatus
12	image exposure device
14	overcoat
16	support base
18	entrance flange
20	media tray
22	preheat station
24	exposure station
32	post heating station
34	media exit tray
38	exposed microcapsule
40	unexposed microcapsule
44	photosensitive media
46	microcapsule
48	image-forming material
50	microcapsule rupturing device
52	microcapsule rupturing roller
56	preheated photosensitive media
58	exposed photosensitive media
60	developed photosensitive media
62	completed image
72	skid plate
78	translation shaft
80	mounting block
82	magnetic bar
84	mounting shaft
86	dual flanged ferrous rupturing roller
90	segmented rupturing roller
92	rupturing roller segment
94	ferrous load segment
96	pivot

98	first magnet
100	second magnet
102	third magnet
104	load arm
106	deformable rubber layer
108	internal deformable rubber layer
110	upper segmented rupturing roller
112	lower segmented rupturing roller
114	upper pressure roller
116	lower pressure roller
118	pressure roller load shaft